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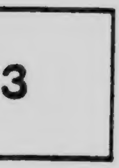

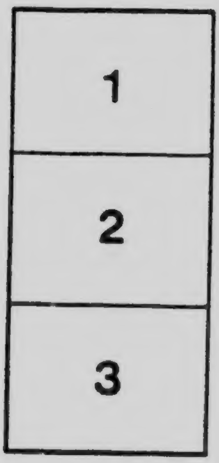

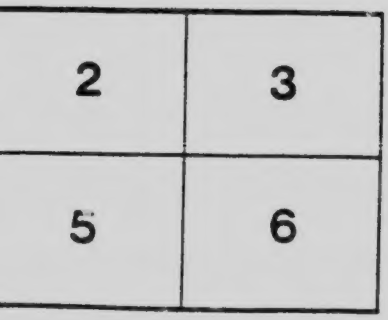

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PUBLIC
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Dominion Astroph
VICTO
Vol. I,

THE ORBITS OF THE SPEC
OF BOS

BY W. E.

This star (1900 $\alpha = 19^h\ 36{\cdot}4^m$, $\delta = +54$
was found to be a binary from the double lin
nine plates were secured during the summer,
present solution. These four, taken before
a phase in the orbit where the spectra are partia
Of the remaining twenty-five all but four h
the determination of the orbit rests on the eq
on Seed 30 emulsion with the single prism s
central ray λ4200 of 25·7 angstroms per milli

The spectra of the two components are
being barely sufficient to enable one to tell
set of lines belongs. The lines of both comp
dozen on the average were measured in each
the probable error of a plate for component 1
±2·1, and for the other ±2·5 km. per sec.
nearly equal, component 2 having a mass 0·9

CANADIANA

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VICTORIA

Vol. I, No. 9

SPECTROSCOPIC COMPONENTS

F BOSS 5026

W. E. HARPER

= +54° 44′, photographic magnitude 6·3, type F5)
ble lines shown on the first plate made. Twenty-
mmer, all but four of which have been used in the
before the approximate period was known, fall at
e partially superposed and hence are unmeasurable.
four have both components measurable, so that
the equivalent of forty-six plates. All were made
prism spectrograph, which has a dispersion at the
r millimetre.

nts are quite similar, the difference in intensities
to tell from inspection to which component each
h components are fuzzy in nature, but as about a
n each case, a fairly reliable result was obtained,
nent 1 (the one with the more intense lines) being
r sec. The masses, as may be expected, are very
ass 0·986 times that of component 1.

In the table of observations following the phases are reckoned from the final value of periastron passage using the corrected period 7·6383 days.

OBSERVATIONS OF BOSS 5026

Plate Number	Date	Julian Date	Phase	Component 1			Component 2		
				Vel.	Lines	O–C	Vel.	Lines	O–C
	1919								
2472	July 21.....	2,422,161·798	6·230	+ 25·7	4	−6·2	− 75·1	4	−11·3
2489	" 22.....	162·797	7·229	+106·0	10	+2·9	−125·1	5	+10·9
2528	" 26.....	166·781	3·575	− 49·2	3	+0·3	+ 25·6	3	+ 6·9
2545	" 27.....	167·800	4·594	− 20·5	15				
2554	" 28.....	168·750	5·544	− 14·6	16				
2683	Aug. 14.....	185·782	7·299	+110·6	11	+4·7	−137·7	9	+ 1·1
2716	" 15.....	186·819	0·698	− 55·7	5	−6·5	+ 16·5	5	− 1·9
2730	" 18.....	189·687	3·566	− 50·3	3	−0·8	+ 23·2	3	+ 4·5
2750	" 19.....	190·730	4·609	− 18·7	21				
2786	" 21.....	192·724	6·603	+ 54·8	16	−0·5	− 87·2	14	+ 0·4
2801	" 22.....	193·704	7·583	+ 87·5	10	−0·8	−117·4	10	+ 3·6
2815	" 24.....	195·747	1·987	− 66·8	10	+4·5	+ 44·3	8	+ 3·5
2873	Sept. 1.....	203·731	2·332	− 66·8	7	+0·5	+ 39·0	7	+ 3·3
2881	" 6.....	208·735	7·337	+110·1	20	+3·4	−137·7	13	+ 1·9
2888	" 7.....	209·694	0·658	− 47·8	3	−2·1	+ 12·1	3	− 2·7
2908	" 9.....	211·668	2·632	− 61·3	10	+5·0	+ 39·6	8	+ 3·9
2924	" 12.....	214·664	5·628	− 16·5	19				
2943	" 14.....	216·695	7·659	+ 72·8	11	−1·1	−107·7	9	− 1·4
2980	" 16.....	218·660	1·986	− 70·8	13	+0·5	+ 40·1	9	− 0·7
3013	" 20.....	222·750	6·076	+ 25·6	6	+1·8	− 57·5	5	− 1·9
3037	" 21.....	223·666	6·992	+ 86·4	14	−0·8	−116·7	11	+ 3·6
3038	" 21.....	223·689	7·015	+ 82·8	15	−4·4	−126·7	13	− 6·4
3065	" 23.....	225·673	1·360	− 72·5	14	−0·5	+ 42·5	13	+ 1·0
3142	Oct. 6.....	238·609	6·658	+ 55·3	16	−3·8	− 95·2	14	− 3·8
3177	" 14.....	2,422,246·595	7·005	+ 88·3	12	+1·1	−120·3	12	+ 0·1

The period was obtained early in the observations, thus avoiding to a large extent useless plates at phases where the lines would be hopelessly mixed. In addition, this knowledge of the general form of the curve made possible the securing of separated spectra close to the crossing points by narrowing the collimator slit from its usual width of 0·051 mm. Nicely resolved lines were secured where the difference in velocity was of the order of 70 km. per sec., and in one case a difference of 60 km. gave lines clearly double in the violet region.

From the preliminary elements given later observation equations were built up according to the notation of Lehmann-Filhés, modified to suit cases of double spectra*, and a least—squares solution effected. As no early observations existed whereby the preliminary value of the period might be corrected, this term was also included in the solution. This practically necessitated treating all the observations separately, and only where they were taken on one night or where they fell on a smooth part of the curve was this principle departed from. In this connection the four plates showing single lines

* Dominion Observatory Publications, Vol. I, page 327.

and which group themselves symmetrically about one of the crossing points were formed into one normal place. By making the following transformations a set of 35 observation equations involving the 7 unknowns γ, K_1, K_2, e, ω, P and T were built up. The weights of each are as given in the last column.

$$\begin{aligned} x &= \delta\gamma \\ y &= \delta K_1 \\ z &= \delta K_2 \\ u &= 92 \cdot \delta e \\ v &= 92 \cdot \delta\omega \\ w &= [3 \cdot 23104]\ \delta P \\ l &= [2 \cdot 11385]\ \delta T \end{aligned}$$

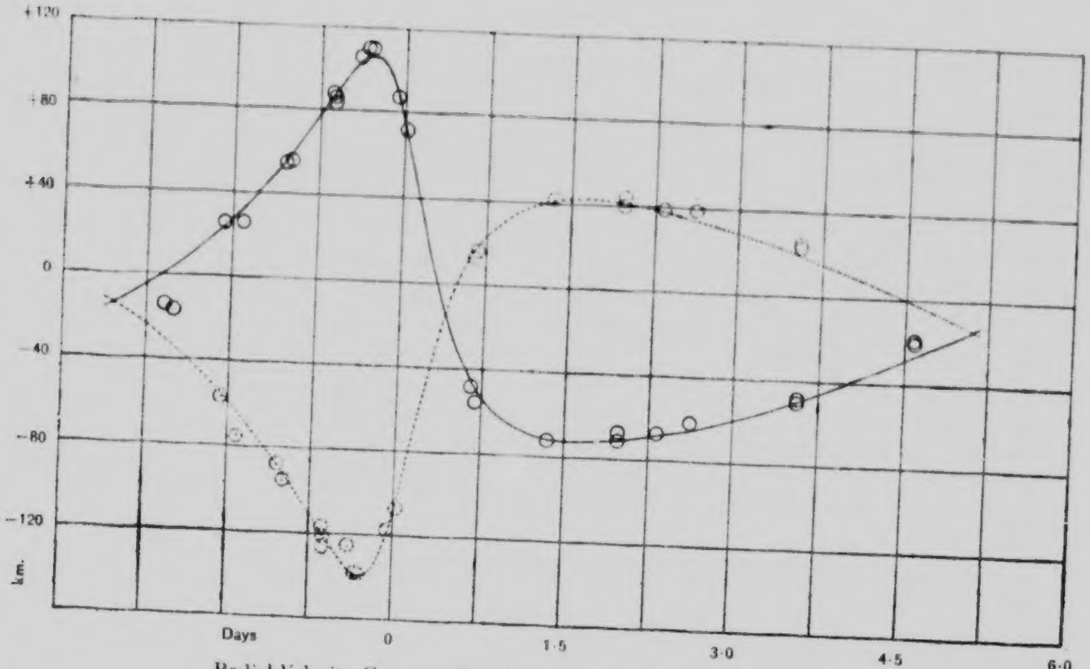
OBSERVATION EQUATIONS FOR BOSS 5026

1	1·000x	+ ·431y	·000z	− ·982u	+ ·589v	− ·064w	− ·377l	−2·200 = 0	0·6
2	1·000	+ ·502	·000	−1·114	+ ·582	+ ·173	− ·412	+4·200	0·4
3	1·000	+ ·760	·000	−1·447	+ ·511	+ ·060	− ·544	−1·100	1·6
4	1·000	+ ·819	·000	−1·480	+ ·484	− ·200	− ·572	+3·800	1·6
5	1·000	+1·122	·000	−1·224	+ ·248	− ·134	− ·668	+2·400	2·5
6	1·000	+1·134	·000	−1·191	+ ·234	− ·287	− ·668	− ·200	1·2
7	1·000	+1·297	·000	− ·420	− ·039	+ ·215	− ·523	−2·900	1·0
8	1·000	+1·347	·000	+ ·092	− ·205	+ ·060	− ·333	−2·900	1·1
9	1·000	+1·364	·000	+ ·417	− ·315	− ·008	− ·166	−0·900	2·0
10	1·000	+1·184	·000	+1·131	− ·987	− ·136	+1·363	+5·200	1·0
11	1·000	+ ·986	·000	+ ·479	−1·195	+ ·245	+1·883	+1·700	1·1
12	1·000	− ·384	·000	−1·213	−1·068	+ ·039	+ ·650	−3·800	0·3
13	1·000	− ·412	·000	−1·093	−1·034	− ·100	+ ·587	+1·500	0·5
14	1·000	− ·630	·000	+ ·538	− ·479	+ ·007	+ ·031	−1·700	1·4
15	1·000	− ·603	·000	+ ·966	− ·171	− ·003	− ·071	−2·900	2·0
16	1·000	− ·541	·000	+1·024	+ ·007	− ·004	− ·102	−2·000	1·5
17	1·000	− ·356	·000	+ ·779	+ ·281	+ ·037	− ·141	+ ·800	0·6
18	1·000	+ ·023	·000	− ·076	+ ·529	+ ·041	− ·225	+3·500	2·5
19	1·000	·000	− ·431	+ ·982	− ·589	+ ·064	+ ·377	+1·600	0·5
20	1·000	·000	− ·502	+1·114	− ·582	− ·173	+ ·412	+12·700	0·4
21	1·000	·000	− ·760	+1·447	− ·511	− ·060	+ ·544	+1·000	1·4
22	1·000	·000	− ·819	+1·480	− ·484	+ ·200	+ ·572	+3·600	1·4
23	1·000	·000	−1·122	+1·224	− ·248	+ ·134	+ ·668	+2·200	2·0
24	1·000	·000	−1·134	+1·191	− ·234	+ ·287	+ ·668	− ·300	1·2
25	1·000	·000	−1·297	+ ·420	+ ·039	− ·215	+ ·523	−10·500	0·5
26	1·000	·000	−1·347	− ·092	+ ·205	− ·060	+ ·333	−2·500	0·9
27	1·000	·000	−1·364	− ·417	+ ·315	+ ·008	+ ·166	−4·000	1·3
28	1·000	·000	−1·184	−1·131	+ ·987	+ ·136	−1·363	−7·800	1·0
29	1·000	·000	− ·986	− ·479	+1·195	− ·245	−1·883	+ ·700	0·9
30	1·000	·000	+ ·384	+1·213	+1·068	− ·039	− ·650	+7·000	0·3
31	1·000	·000	+ ·412	+1·093	+1·034	+ ·100	− ·587	+5·200	0·5
32	1·000	·000	+ ·630	− ·538	+ ·479	− ·067	− ·031	− ·800	1·3
33	1·000	·000	+ ·603	− ·966	+ ·171	+ ·003	+ ·071	−3·000	1·5
34	1·000	·000	+ ·541	−1·024	− ·007	+ ·004	+1·024	−5·800	1·3
35	1·000	·000	+ ·356	− ·779	− ·281	− ·037	+ ·141	−7·900	0·5

00925710

NORMAL EQUATIONS

39·800x	+11·541y	−9·015z	−0·470u	+ 1·083v	+0·089w	− 0·092l	− 8·560=0
	18·686	+0·000	−8·922	− 0·221	−0·474	− 2·376	+14·672
		14·806	−7·509	− 0·015	−0·619	− 0·972	+ 5·959
			38·665	−10·589	+2·028	+13·284	+33·860
				11·027	−0·717	−11·447	− 7·071
					0·691	+1·366	− 1·518
						18·914	+ 7·589



Radial Velocity Curves of Boss 5026 showing Individual Observations.

The solution of these equations gave small corrections to the preliminary elements, as may be noted in the table following. One solution was seen to be sufficient, as judged by the agreement of the ephemeris residuals and those contained by substituting directly in the observation equations. The sum of the squares of the residuals for the normal places was reduced from 527 to 386, about 27 per cent.

TABLE OF ELEMENTS

Element	Preliminary	Final
Period P	7·635 days	7·6383 days ± ·0019 days
Eccentricity e	·55	·527 ± ·006
Longitude of apse ω_1	48°	46°·74 ± 0°·81
Longitude of apse ω_2	228°	226°·74 ± 0°·81
Velocity of system γ	−16·26 km.	−15·59 km. ± 0·36 km.
Semi-amplitude primary K_1	92 km.	89·81 km. ± 0·69 km.
Semi-amplitude secondary K_2	92 km.	91·12 km. ± 0·71 km.
Periastron passage T	J.D. 2,422,201·405	J.D. 2,422,201·398 ± 0·007
Semi major axis $a_1 \sin i$		8,017,000 km.
" " $a_2 \sin i$		8,134,000 km.
Mass primary $m_1 \sin i$		1·854 $\odot$
Mass secondary $m_2 \sin i$		1·827 $\odot$

The graph shown represents the final elements, the continuous curve being that of the so-called component 1, the dotted curve that of the other. Individual observations are plotted.

Dominion Astrophysical Observatory,
Victoria, B.C.
Nov. 7, 1919.